

## CLAIMS

What is claimed is:

1. A navigated stemmed implant inserter for use with a stemmed orthopaedic implant and a surgical navigation system during joint replacement surgery on a bone, the inserter comprising:
  - a stem engaging member engageable with the stemmed orthopaedic implant in rigid relative arrangement; and
  - a reference member trackable by the surgical navigation system, the reference member being supported in a known rigid relationship to the stemmed orthopaedic implant such that the surgical navigation system may determine the position and orientation of the stemmed orthopaedic implant relative to the bone by detecting the position and orientation of the reference member and resolving the position and orientation of the stemmed orthopaedic implant from a known relationship between the reference member and the stemmed orthopaedic implant.
2. The navigated stemmed implant inserter of claim 1 wherein the reference member is detectable using a detection technology selected from the group consisting of electromagnetic, acoustical, and imaging.
3. The navigated stemmed implant inserter of claim 2 wherein the reference member actively produces a signal detectable by the surgical navigation system.
4. The navigated stemmed implant inserter of claim 2 wherein the reference member is passively detected by the surgical navigation system.

5. The navigated stemmed implant inserter of claim 1 wherein the surgical navigation system is able to resolve and display one or more position parameters of the stemmed orthopaedic implant relative to the bone selected from the list consisting of depth, rotation, anterior-posterior tilt, and medial-lateral tilt.
6. The navigated stemmed implant inserter of claim 1 wherein the stem engaging member includes a ring-shaped head having a bore with a bore axis for receiving a neck of the stemmed orthopaedic implant.
7. The navigated stemmed implant inserter of claim 6 wherein the head includes a sleeve disposed in the bore to isolate the stemmed orthopaedic implant from the head.
8. The navigated stemmed implant inserter of claim 7 wherein the sleeve comprises a polymer.
9. The navigated stemmed implant inserter of claim 7 further comprising a retention plate disposed over the sleeve to retain the sleeve in the bore.
10. The navigated stemmed implant inserter of claim 6 further comprising:
  - a stem locking member mounted to the inserter for translation along a stem locking axis transverse to the bore axis of the head, the stem locking member being movable between a first position in which the neck of the stemmed orthopaedic implant may be disengaged from the head and a second position in which the neck is prevented from being disengaged from the head.
11. The navigated stemmed implant inserter of claim 10 further comprising:
  - an actuator mounted to the inserter for rotation and translation along the stem locking axis, the actuator being able to convert rotary input to the actuator into linear

motion to move the stem locking member from the first position to the second position.

12. The navigated stemmed implant inserter of claim 11 wherein the stem locking member and actuator are separate elongated members coaxially aligned with one another, the inserter further comprising a spring mounted adjacent the stem locking member to bias the stem locking member toward the actuator.
13. The navigated stemmed implant inserter of claim 11 wherein the actuator includes a locking ring abutment portion and the stemmed implant inserter further comprises a locking ring threaded onto the inserter, the locking ring being moveable between a first position in which it is spaced from the locking ring abutment portion and a second position in which it abuts the locking ring abutment portion.
14. The navigated stemmed implant inserter of claim 13 wherein the locking ring abutment portion comprises a radially extending flange.
15. The navigated stemmed implant inserter of claim 11 further comprises an auxiliary handle mounted transversely to the stem locking axis.
16. The navigated stemmed implant inserter of claim 15 further comprising a plurality of handle mounting fittings such that the handle may be mounted in a plurality of positions transverse to the actuator axis.
17. The navigated stemmed implant inserter of claim 1 wherein the inserter includes a plurality of reference member mounting fittings such that the reference member may be mounted in a plurality of positions.

18. A navigated femoral stem inserter for use with a surgical navigation system during hip replacement surgery on a femur to insert a hip stem implant, the hip stem implant including a projecting neck, the inserter comprising:

    a stem engaging member including a ring shaped head having a bore with a bore axis, the bore being engageable with the neck of the hip stem implant;

    a stem locking member mounted for translation along an axis transverse to the bore axis, the stem locking member being movable between a first position in which the neck may be disengaged from the bore and a second position in which the neck is prevented from being disengaged from the bore; and

    a reference member trackable by the surgical navigation system, the reference member being supported in a known rigid relationship to the hip stem implant when the stem locking member is in the second position such that the surgical navigation system may determine the position and orientation of the hip stem implant relative to the femur by detecting the position and orientation of the reference member and resolving the position and orientation of the hip stem implant from a known relationship between the reference member and the hip stem implant.

19. A method for inserting a stemmed orthopaedic implant into a bone during joint replacement surgery using a surgical navigation system, the method comprising:

    providing an inserter comprising a stem engaging member and a reference member trackable by the surgical navigation system;

    engaging the inserter with the stemmed orthopaedic implant in rigid relative arrangement;

tracking the stemmed orthopaedic implant with the surgical navigation system by detecting the position of the reference member and resolving the position of the stemmed orthopaedic implant with the surgical navigation system; and guiding the stemmed orthopaedic implant to a desired position relative to the bone by referencing the surgical navigation system.

20. The method of claim 19 wherein guiding the stemmed orthopaedic implant to a desired position comprises guiding the stemmed orthopaedic implant to one or more desired position parameters selected from the group consisting of depth, rotation, anterior-posterior tilt, and medial-lateral tilt.

21. The method of claim 19 further comprising:  
broaching an opening in the bone with a rasp to receive the stemmed orthopaedic implant;  
recording the final position of the rasp relative to the bone in the surgical navigation system; and  
guiding the stemmed orthopaedic implant to a position in the bone corresponding to the final position of the rasp relative to the bone by referencing the surgical navigation system.